REMARKS

I. Procedural Matters

Rather than writing an examiner's answer and sending the instant application to the Board of Appeals, the Examiner has issued a new office action, including the same outstanding rejection (Mohri et al in view of Huang or Ali et al), and adding a new rejection based on Mohri et al in view of Aihara et al and Dictionary of Ceramic Science and Engineering. Additionally, the Examiner has reinstated the objection to the abstract.

Applicants elect to respond to the Examiner's new rejection by continuing prosecution before the Examiner.

Claim 1 has been amended for clarity.

II. The Objection to the Abstract

The Abstract is objected to as allegedly containing "legal phraseology.

To facilitate prosecution, Applicants have amended the amendment to the abstract to replace the terms "comprising" and "said" and to place the abstract in one paragraph form.

It is respectfully submitted that Applicant's abstract fully complies with 37 C.F.R. §1.72(b) and MPEP §608.01(b) and it is requested that the objection to the Abstract be reconsidered and withdrawn.

III. The Rejection Based on Mohri et al in view of Huang or Ali et al

Claims 1-8 are rejected under 35 U.S.C. §103 as allegedly being obvious over Mohri et al in view of Huang or Ali et al.

The Examiner's statement of the rejection remains, verbatim, the same as previously stated in the Office Action dated June 1, 2001.

In the penultimate paragraph of page 5, the Examiner repeats his previous position that Applicants' claim language "a polyhedral particle having substantially no fractured surface" reads on the presence of a single particle having no fracture surface and that "it is notoriously well known in the art that during mixing or milling some particles are unchanged and thus no fracture surfaces exist.

In the last paragraph of page 5, the Examiner repeats his previous position that pore sizes, density and ingredient amounts would be within the realm of routine experimentation and that it would be obvious to optimize the process conditions.

Applicants respectfully submit that the present invention is not obvious over the disclosures of Mohri et al in view of Huang or Ali et al and request that the Examiner reconsider and withdraw this rejection in view of the following remarks.

The present invention relates to a process for producing a polycrystalline alumina sintered body which comprises the step of preparing a slurry by subjecting alumina powder and a solvent to ultrasonic irradiation, mechanical stirring not using a grinding medium, or ultrasonic irradiation and mechanical stirring not

using a grinding medium, to provide a slurry of alumina dispersed in a solvent. The slurry is dried and formed to produce a green body. The green body is then sintered in an air atmosphere at a temperature in the range of 1400°C to 1800°C.

As set forth in claim 1, the alumina powder has a purity of 99.99 wt% or more, and comprises α alumina particles having substantially no fractured surface. Claim 1 sets forth specific properties for the alumina powder, including a particle size of 0.1 to 1.0 μm.

In essence, the Examiner has argued that Huang and Ali et al disclose mixing a slurry of powder and solvent by ultrasonic energy, and argues that in view of the teaching at column 6, line 31 of Mohri et al that the mixing in Mohri et al can be carried out in any conventional manner, it would have been obvious to employ an ultrasonic mixing to make the slurry in Mohri et al.

Both Huang and Ali et al disclose employing ultrasonic mixing to make a slurry. Appellants submit, however, that one of ordinary skill in the art would not have been led to combining the teaching of these references with Mohri et al because their technical fields are much different from each other and they do not relate to the same art.

In particular, according to Mohri et al, the main object of the invention is to provide an alumina composition which provides, on sintering, an alumina ceramic

having wrap resistance and high dimensional precision. See Mohri et al, column 2, lines 5-8.

On the other hand, the object of the invention disclosed in Ali et al is to provide an improved packaging material for use with electronic devices. See Ali et al, column 2, lines 9-20. The Ali et al patent is directed to making an alumina nitride/aluminum composite, and does not relate to making alumina slurries.

Further, the invention disclosed in Huang is directed to a method for producing a sintered reaction bonded silicon nitride composite which is reinforced with silicon carbide whiskers, which contains silicon nitride particles, or both. Thus, the Huang patent is directed to a silicon nitride composite containing silicon carbide whiskers or silicon nitride powders, and does not have anything to do with making alumina slurries.

Appellants submit that the inventions described in these references provide different materials or devices with different features. Accordingly, one of ordinary skill in the art would not have had any motivation to combine the teachings of these references.

With respect to appellants' argument that one of ordinary skill in the art would not have combined the teachings of Huang and Ali et al with those of Mohri et al because they do not relate to the same art, the Examiner has argued that all of these references relate to ceramic materials. More particularly, the Examiner has

argued that the references relate to the mixing of slurries of ceramic materials and, therefore, they all relate to the same art, that is, the art of mixing ceramic slurries.

Appellants submit that this argument of the Examiner is not well founded because it is an over simplification to state that all of the references relate to the same art of mixing ceramic slurries. The references, in fact, relate to making different compounds by different reactions. Mohri et al relate to making an alumina composition, Ali et al relate to making an aluminum nitride/aluminum composite, and Huang relates to a silicon nitride composite. Since the references relate to different compounds, applicants submit that they do not relate to the same art, and that one of ordinary skill in the art would not have been led to combining them.

Further, the primary particle size of the aluminum nitride powder used in Ali et al is about 38 μm (passing through a 400 mesh opening size 0.0015 inch, as disclosed in Ali et al, column 4, lines 3 to 15), and the primary particle size of powdered silicon (a nonmetallic element) used by Huang is not greater than 5 μm, as disclosed in Huang, column 2, lines 29 to 30. (In Example 1, Huang discloses powdered silicon having an 8 μm particle size as a raw material, which is then dry milled to obtain silicon powder having a 4 μm average particle size (range 2 to 20 μm)). These particle sizes are much different from each other. While the primary particle size of the alumina powder in Mohri et al (0.1 to 5 μm, as disclosed at

column 5, lines 58 to 60) at the lower end of its range may be similar to the primary particle size of the alumina that is used in the present invention (0.1 to 1 μm), the primary particle size of the different powders used in Ali et al or Mohri et al are much different from each other. Further, the primary particle size disclosed in Huang relates to a nonmetallic element (silicon) and not a metal-containing compound which is either the aluminum nitride of Ali et al or the alumina (aluminum oxide) of Mohri et al. Accordingly, these prior inventions use different raw materials.

In view of the above, appellants submit that there is no motivation to combine the teachings of either Huang or Ali et al with Mohri et al.

In summary, the references do not relate to that same art, and one of ordinary skill in the art would not have been led to combining the teachings of these references.

It has not been shown that a person of ordinary skill, seeking to solve a problem in the area of an alumina ceramic Mohri et al, would reasonably be expected or motivated to look to a method of making silicon nitride composite containing silicon carbide whiskers or silicon nitride powders (Huang) or directed to making an alumina nitride/aluminum composite (improved packaging material for use with electronic devices) (Ali et al). The combination of elements from non-analogous sources, in a manner that reconstructs the applicant's invention only

with the benefit of hindsight, is insufficient to present a prima facie case of obviousness. There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself. In re Oetiker 24 USPQ2d 1443, 1446 (Fed. Cir. 1992)

Turning now to the statement in Mohri et al that conventional mixing can be used, this statement refers to conventional methods of mixing alumina slurries. Mohri et al describe two such methods, namely, ball mill or a vibration mill, each of which involves a grinding. Thus, Mohri et al, at column 6, lines 30 to 32 and at lines 60 to 62, state that "Mixing of α-alumina and the other components can be carried out in a conventional manner, for example, by means of a ball mill or a vibration mill". According to this description, a ball mill or a vibration mill are the conventional methods of mixing α-alumina. Appellants submit that is was not conventional to mix α alumina by ultrasonic mixing.

Mohri et al, at column 4, lines 14-15, does refer to "ultrasonication", but this description relates to a method for mixing transition alumina and seed crystal to produce α-alumina and not for dispersing α-alumina to prepare a slurry. Appellants submit that these descriptions in Mohri et al support appellants' position that Mohri et al do not teach or imply ultrasonic irradiation as a conventional method for dispersing α-alumina.

With respect to appellants' argument that it was not conventional to mix alpha alumina by ultrasonic mixing, the Examiner has asserted that arguments of counsel cannot take the place of evidence, and that the disclosure in Mohri et al of specific mixing processes do not limit the broad statement in Mohri et al that mixing can be carried out in a conventional manner.

In response, appellants submit that the burden is on the Examiner to show that it was conventional to mix α alumina by ultrasonic mixing, rather than on appellants to show that it was not conventional to mix α alumina by ultrasonic mixing. The Examiner has not provided any evidence to support his position that it was conventional to mix α alumina by ultrasonic mixing. Rejections cannot be based on unsupported assertions by the Examiner.

One of the purposes of employing the ultrasonic mixing in the present invention, as disclosed at page 10 of the present specification, is to reduce the formation of aggregates. The Huang patent, at column 3, lines 23 to 25, discloses that ultrasonic vibration breaks down agglomerates.

As described at page 10 of the present specification, the alumina powder used as a raw material in the present invention contains such a small amount of agglomerates, and such uniform particle shape and particle size, that the alumina powder can be dispersed to form a uniform slurry only by irradiating with ultrasonic wave. It is also well known that the mixing methods using grinding

media have higher energy to reduce the formation of agglomerates than an irradiation with ultrasonic wave. Thus, even if Huang discloses ultrasonic irradiation to reduce the formation of agglomerates, it does not mean that it is obvious to replace the mixing methods using the grinding media in Mohri et al with the ultrasonic mixing technique of Huang because Huang does not disclose or teach the alumina powder used in the present invention that contains small amount of agglomerates and has a uniform particle shape and the particle size recited in claim 1. Further, Huang merely discloses the use of an ultrasonic mixer.

With respect to appellants' argument that even though Huang discloses ultrasonic irradiation to reduce the formation of agglomerates, this disclosure does not mean it would have been obvious to replace the mixing methods using the grinding media in Mohri et al with the ultrasonic mixing technique of Huang because Huang does not teach the alumina powder employed in the present invention and merely discloses the use of an ultrasonic mixer, the Examiner has argued that he is citing Huang for a teaching of a mixing method and not a teaching of the materials. The Examiner has asserted that Mohri et al call for conventional mixing, not grinding, and Huang clearly teaches a mixing technique.

In response, since Mohri et al describe that the conventional mixing is done by mixing techniques that employ grinding, appellants maintain that the conventional mixing in Mohri et al refers to mixing that employs grinding

techniques. Moreover, contrary to the Examiner's assertion, the mixing method cannot be divorced from the materials that are being mixed.

The Examiner is improperly ignoring the different compositional, structural and functional differences between Mohri et al, Huang and Ali et al when making the combination. "The test for combining references is not what the individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art." In re McLaughlin, 170 USPQ 209, 212 (CCPA 1971).

Additionally, as can be seen from the discussion of particle sizes set forth above, the particle size used by Mohri et al may be much smaller (0.1 μm) than that used by Huang or by Ali et al. Alumina powders having a large particle size, such as the 4 μm size in Huang or the 38 μm size in Ali et al (which are sizes for particles other than alumina), may be somehow well dispersed by ultrasonic irradiation because such an alumina powder has a weak force to agglomerate, but a smaller particle size has a stronger force to agglomerate. A small particle size, such as of less than 1 μm as recited in the present claims, is usually considered to be difficult to well disperse by a weak pulverizing power such as ultrasonic irradiation.

If α-alumina is not dispersed in a slurry, the density of a sintered body obtained by calcining a green body produced by the slurry does not increase, and a high density sintered body like that of the present invention cannot be obtained.

Huang and Ali et al are silent about whether ultrasonic irradiation can be applied to a small particle size powder of 0.1 to 1 μm to obtain a well-dispersed slurry. Moreover, neither Huang nor Ali et al teach or imply the effect of application of ultrasonic irradiation to small particle size powder. Accordingly, even if Huang or Ali et al are combined with Mohri et al, it may, somehow render obvious a method for mixing transition alumina and seed crystal by ultrasonic irradiation to produce α-alumina, but it would not render obvious a method for dispersing α-alumina to prepare a slurry by ultrasonic irradiation.

In view of the above, appellants submit that there is no motivation to combine Mohri et al with Ali et al or Huang, much less to replace the mixing methods using the grinding media in Mohri et al with the ultrasonic mixing technique of Huang or Ali et al.

The Examiner further has stated that the recitation in the claims that the particles have substantially no fractured surface covers the presence of a single particle having no fractured surface. The Examiner has stated that "it is notoriously well known in the art that during mixing or milling some particles are unchanged and thus no fractured surfaces exist".

As regards substantially "no fractured surface", appellants submit that the Examiner misunderstands the recitations of the present claims. According to the present invention, the particles having substantially no fractured surface are the

alumina powder used as a raw material, and are not particles that have been mixed or milled in the steps that occur after the step of preparing the slurry. Thus, it is irrelevant whether some particles are unchanged during mixing or milling.

One of the features of the present invention is to use alumina powder comprising polyhedral particles having substantially no fractured surface. The alumina powder employed in the present invention mainly includes polyhedral powders having substantially no fractured surface. The presence of a single particle having substantially no fractured surface would not satisfy the recitations of the present claims.

By using such specific alumina powder as set forth in claim 1, appellants can achieve the present invention.

Additionally, by using alumina powder comprising particles having substantially no fractured surface, the alumina powder is prevented from secondary agglomeration in the steps after the step of preparing the slurry.

With respect to applicants' arguments concerning the fact that applicants employ particles having substantially no fractured surface, the Examiner has stated that Mohri et al disclose, at columns 4 to 5, a method of preparing the alumina powder that is used in the Mohri et al process. The Examiner has stated that Mohri et al disclose that after these powders are prepared, there may be some instances where the powder are subjected to simple grinding, as disclosed at column 5, line

35. The Examiner has stated that this refers to the powder before the slurry is prepared.

In response, appellants submit that the disclosure at column 5, line 35 of Mohri et al does not satisfy the recitations of the present claims of employing a powder having substantially no fractured surface. Mohri et al, at column 5, line 35, do not state that these powders have substantially no fractured surface. Appellants submit that the burden is on the Examiner to establish that Mohri et al contain a disclosure of the use of powders having substantially no fractured surface.

Further, in the experiments disclosed in Mohri et al, alumina powder was subjected to a ball milling. That is, alumina powder was dry blended, so that the alumina powder had fractured surfaces before preparing the slurry.

In view of the above, appellants submit that the cited prior art does not disclose or suggest the use of an alumina powder having substantially no fractured surface.

In view of the above, appellants submit that there is no motivation to combine Huang or Ali et al with Mohri et al, and that even if there is, the present invention is not obvious over Mohri et al in view of Huang or Ali et al.

For the above reasons, it is respectfully submitted that the subject matter of claims 1-8 is neither taught by nor made obvious from the disclosures of Mohri et al

and Huang or Ali et al, and it is requested that the rejection under 35 U.S.C. §103(a) be reconsidered and withdrawn.

IV. The Rejection Based on Mohri et al in view of Aihara et al and the Dictionary of Ceramic Science and Engineering

Claims 1-8 are rejected under 35 U.S.C. §103 as allegedly being obvious over Mohri et al in view of Aihara et al and the Dictionary of Ceramic Science and Engineering.

The Examiner's position with respect to Mohri et al remains the same. The Examiner states Aihara et al discloses a slurry of alumina powder and solvent formed by mechanical stirring not using a grinding medium (i.e., mixing with a trommel). The Examiner concludes that it would have been obvious to us the trommel mixing process of Aihara et al in the processes of Mohri et al in view of the statement in Mohri et al that mixing can be carried out in any conventional manner.

The Examiner also states that the alumina powder of Aihara et al lies within the particle size of claim 1.

Applicants respectfully submit that the present invention is not anticipated by or obvious over the disclosures of Mohri et al in view of Aihara et al and the Dictionary of Ceramic Science and Engineering and request that the Examiner reconsider and withdraw this rejection in view of the following remarks.

First of all, the Dictionary of Ceramic Science and Engineering is only cited for the definition of a trommel.

Applicants' position concerning the disclosures of Mohri et al remain as stated above in Section III. Like Mohri et al, Aihara et al is not related to Applicants' claimed type of alumina powder starting material. Thus, the teachings of Aihara et al do not overcome the deficiencies in the disclosures of Mohri et al relating to the type of alumina powder starting material. Particularly, Aihara et al is not related to alumina powder having polyhedral shape. Therefore, even if the disclosures of Mohri et al are combined with Aihara et al, the present invention is not obvious over the combination of these references.

Additionally, while Mohri et al is directed to an alumina composition which provides on sintering an alumina ceramic having wrap resistance and high dimensional precision, Aihara et al is directed to a ceramic part to be exposed to a corrosive gas. Therefore, Applicants respectfully submit that the technical field of Mohri et al is not related to that of Aihara et al. Accordingly, it is respectfully submitted that the Examiner has not established a motivation to combine Mohri et al with Aihara et al.

The Examiner's argument seems to be based on the fact that two different mixing techniques are known in the art. However, Applicants respectfully submit that various mixing methods being known in the art for use in different and

unrelated processes and purposes, and in different and unrelated references, does not make their combination obvious to one of ordinary skill in the art.

The Federal Circuit has held that the fact that each element in a claimed invention is old or unpatentable does not determine the non-obviousness of the claimed invention as a whole. Custom Accessories Inc. v. Jeffrey-Allan Industries Inc., 1 USPQ 2d 1196, 1198 (Fed. Cir. 1986).

> [P]rior art references before the tribunal must be read as a whole and consideration must be given where references diverge and teach away from the claimed invention. Moreover, appellants cannot pick and choose among individual parts of assorted prior art references "as a mosaic to recreate a facsimile of the claimed invention." Akzo N.V. v. U.S. International Trade Commission, 1 USPQ 2d 1241, 1246 (Fed. Cir. 1986, citations omitted).

Applicants respectfully submit that the Examiner is merely recreating Applicants' invention from various unrelated pieces of art using hindsight.

For the above reasons, it is respectfully submitted that the subject matter of claims 1-8 is neither taught by nor made obvious from the disclosures of Mohri et al in view of Aihara et al and the Dictionary of Ceramic Science and Engineering, and it is requested that the rejection under 35 U.S.C. §103(a) be reconsidered and withdrawn.

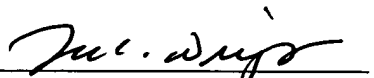
V. Conclusion

In view of the above, Applicants respectfully submit that their claimed invention is allowable and ask that the objection to the abstract and the rejections under 35 U.S.C. §103 be reconsidered and withdrawn. Applicants respectfully submit that this case is in condition for allowance and allowance is respectfully solicited.

If any points remain at issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the local exchange number listed below.

Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1 (Twice Amended). A process for producing a polycrystalline alumina sintered body which comprises the steps of:

preparing a slurry by subjecting alumina powder and a solvent to ultrasonic irradiation, mechanical stirring not using a grinding medium, or ultrasonic irradiation and mechanical stirring not using a grinding medium, to provide a slurry of alumina dispersed in a solvent;

drying and forming said slurry to produce a green body; and then

sintering said green body in an air atmosphere at a temperature in the range of 1400°C to 1800°C;

wherein said alumina powder has:

a purity of 99.99 wt% or more [and comprises a polyhedral particle having substantially no fractured surface,] and comprises α alumina particles having a polyhedral shape, each having substantially no fractured surface,[;] and having a D/H ratio of from 0.5 or more to 3.0 or less, wherein D represents a maximum particle diameter parallel to the hexagonal lattice plane of a hexagonal close packed lattice of α alumina, and H represents a maximum particle diameter perpendicular to the hexagonal lattice plane of a hexagonal close packed lattice of α alumina;

[the] a number-average particle size of from 0.1 μm or more to 1.0 μm or less; and

a D90/D10 ratio of 7 or less, wherein D10 and D90 are the particle sizes at 10% cumulation diameter and 90% cumulation diameter, respectively, from the smallest particle side in a cumulative particle size distribution.

IN THE ABSTRACT OF DISCLOSURE:

The abstract is changed as follows:

A process for producing a polycrystalline alumina sintered body which [comprises] includes the steps of: subjecting alumina powder to ultrasonic irradiation, mechanical stirring not using a grinding medium, or ultrasonic irradiation and mechanical stirring not using a grinding medium, resulting in slurry dispersed in a solvent; drying and forming [said] the slurry to produce a green body; and then sintering [said] the green body in an air atmosphere at a temperature in the range of 1400 °C to 1800 °C; wherein [said] the alumina powder [having] has: a purity of 99.99 wt% or more and includes [comprises a polyhedral particle having substantially no fractured surface, and comprises] α alumina particles having polyhedral shape, having substantially no fractured surface[;] and a D/H ratio of from 0.5 or more to 3.0 or less; the number-average particle size of from 0.1 μm or more to 1.0 μm or less; and a D90/D10 ratio of 7 or less.